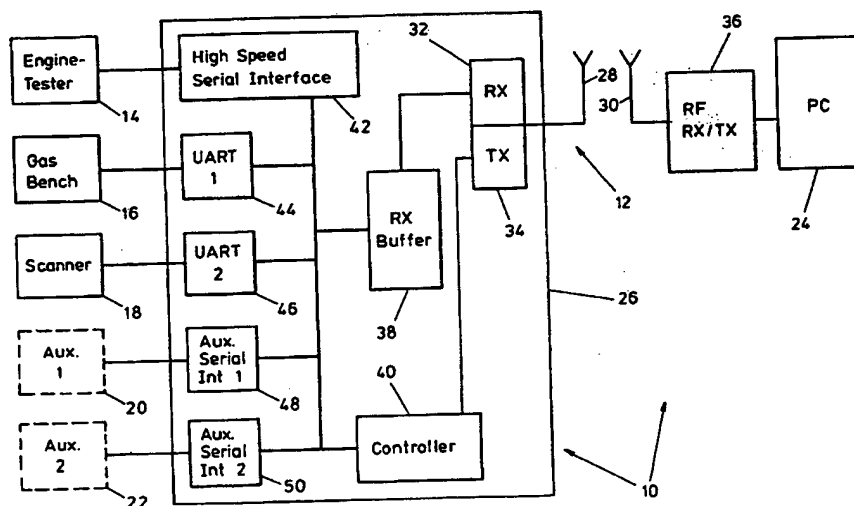




## INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification <sup>6</sup> : <b>G08C 15/02, 17/02</b>		A3	(11) International Publication Number: <b>WO 98/44471</b>
			(43) International Publication Date: 8 October 1998 (08.10.98)
(21) International Application Number: PCT/GB98/00866 (22) International Filing Date: 3 April 1998 (03.04.98) (30) Priority Data: 9706797.9                      3 April 1997 (03.04.97)                      GB (71) Applicant (for all designated States except US): SUN ELECTRIC UK LIMITED [GB/GB]; Unit 12, Horsleys Fields, King's Lynn, Norfolk PE30 5DD (GB). (72) Inventors; and (75) Inventors/Applicants (for US only): JONES, Barbara, Lynn [GB/GB]; Sun Electric UK Limited, Unit 12, Horsleys Fields, King's Lynn, Norfolk PE30 5DD (GB). SMITH, Paul [GB/GB]; Sun Electric Limited, Unit 12, Horsleys Fields, King's Lynn, Norfolk, PE30 5DD (GB). (74) Agent: ARCHER, Philip, Bruce; Urquhart-Dykes & Lord, New Priestgate House, 57 Priestgate, Peterborough, Cambs PE1 1JX (GB).		(81) Designated States: AU, CA, CN, JP, KR, MX, US, European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE). <b>Published</b> <i>With international search report.          Before the expiration of the time limit for amending the claims and to be republished in the event of the receipt of amendments.</i> (88) Date of publication of the international search report: 7 January 1999 (07.01.99)	

## (54) Title: WIRELESS MULTIPLEX DATA TRANSMISSION SYSTEM



## (57) Abstract

A method and apparatus for wireless transmission of data through a communications channel between at least two local data sensors (for example automotive diagnostic data sensors or NVH sensors), which may include a primary data-processing function, and data-processing function (for example a PC) to receive data therefrom. The system provides for asymmetrical division of the communications channel on a frequency or time-division or packet-switching basis so that the corresponding asymmetrical data transmission requirement of the local data sensors are matched to the capacity of their respective sub-channels whereby a single channel is capable of transmitting all the required data. A particularly practical application is to noise vibration harshness analysis of wireless-transmitted data from three-dimensionally spaced NVH sensors enabling spacial pinpointing of vibration sources in automotive warranty analysis studies.

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# INTERNATIONAL SEARCH REPORT

International Application No

PCT/GB 98/00866

**A. CLASSIFICATION OF SUBJECT MATTER**  
IPC 6 G08C15/02 G08C17/02

According to International Patent Classification (IPC) or to both national classification and IPC

**B. FIELDS SEARCHED**

Minimum documentation searched (classification system followed by classification symbols)  
IPC 6 G08C G01R H04J G01H A61B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y A	US 4 738 133 A (BRECKEL ET AL) 19 April 1988 see abstract  see column 1, line 63 - column 2, line 31; figures 1,2	1-3,7, 13-15 4-6,8, 16-19
Y A	GB 2 295 070 A (ALPS ELECTRIC CO. LTD.) 15 May 1996 cited in the application see abstract	1-3,7, 13-15  4-6,8, 16-19
A	US 5 509 013 A (ADACHI ET AL) 16 April 1996 cited in the application see abstract see column 1, line 19 - line 64; figure 1	5,17
	-/--	

☒ Further documents are listed in the continuation of box C.

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Date of the actual completion of the international search

29 October 1998

Date of mailing of the international search report

18. 11. 98

Name and mailing address of the ISA

European Patent Office, P.B. 5818 Patentlaan 2  
NL - 2280 HV Rijswijk  
Tel. (+31-70) 340-2040, Tx. 31 651 epo nl,  
Fax: (+31-70) 340-3016

Authorized officer

O'Reilly, D

# INTERNATIONAL SEARCH REPORT

International Application No

PCT/GB 98/00866

## C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	DE 41 31 341 A (MERCEDES-BENZ AKTIENGESELLSCHAFT) 26 November 1992 see abstract see column 1, line 53 - line 64; figures 1,2 ---	2,14
A	DE 41 06 572 A (FRAUNHOFER-GESELLSCHAFT) 3 September 1992 see abstract see column 2, line 20 - line 29; figure 2 ---	24,25
A	EP 0 685 390 A (MITSUBISHI) 6 December 1995 see abstract see column 2, line 36 - column 3, line 2; figure 6 ---	24,25
A,P	US 5 622 170 A (SCHULTZ) 22 April 1997 cited in the application see abstract see column 4, line 25 - line 49; figure 1A -----	24,25

# INTERNATIONAL SEARCH REPORT

International application No.  
PCT/GB 98/00866

## Box I Observations where certain claims were found unsearchable (Continuation of item 1 of first sheet)

This International Search Report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

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because they relate to subject matter not required to be searched by this Authority, namely:
2. ☐ Claims Nos.:  
because they relate to parts of the International Application that do not comply with the prescribed requirements to such an extent that no meaningful International Search can be carried out, specifically:
3. ☐ Claims Nos.:  
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

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This International Searching Authority found multiple inventions in this international application, as follows:

see additional sheet

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2. ☐ As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.
3. ☐ As only some of the required additional search fees were timely paid by the applicant, this International Search Report covers only those claims for which fees were paid, specifically claims Nos.:
4. ☐ No required additional search fees were timely paid by the applicant. Consequently, this International Search Report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

### Remark on Protest

- ☐ The additional search fees were accompanied by the applicant's protest.
- ☒ No protest accompanied the payment of additional search fees.

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

This International Searching Authority found multiple (groups of) inventions in this international application, as follows:

1. Claims: 1-23

Multiplex data transmission via a wireless with different rates in each channel

2. Claims: 24,25

Vibration analysis using a sensor

# INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/GB 98/00866

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
US 4738133	A	19-04-1988	DE 3538687 A EP 0221383 A	07-05-1987 13-05-1987
GB 2295070	A	15-05-1996	JP 8140165 A JP 8191485 A DE 19541637 A US 5737335 A	31-05-1996 23-07-1996 30-05-1996 07-04-1998
US 5509013	A	16-04-1996	JP 7074722 A	17-03-1995
DE 4131341	A	26-11-1992	NONE	
DE 4106572	A	03-09-1992	NONE	
EP 685390	A	06-12-1995	CA 2096069 A CA 2185473 A DE 69315887 D DE 69315887 T EP 0569994 A JP 6135395 A US 5571969 A	15-11-1993 15-11-1993 05-02-1998 20-05-1998 18-11-1993 17-05-1994 05-11-1996
US 5622170	A	22-04-1997	US 5383454 A AU 6666894 A CA 2161126 A EP 0700269 A IL 109385 A JP 8509144 T WO 9423647 A ZA 9402812 A AU 8876391 A CA 2094251 A DE 9117261 U EP 0553246 A SE 9301262 A WO 9206645 A	24-01-1995 08-11-1994 27-10-1994 13-03-1996 10-03-1998 01-10-1996 27-10-1994 22-11-1995 20-05-1992 20-04-1992 06-08-1998 04-08-1993 18-06-1993 30-04-1992



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# INTERNATIONAL SEARCH REPORT

Int. l. Application No

PCT/GB 98/00866

A. CLASSIFICATION OF SUBJECT MATTER  
IPC 6 G08C15/02 G08C17/02

28 Rec'd PCT/PTO 01 OCT 1999

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 6 G08C G01R H04J G01H A61B

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Fax (+31-70) 340-2016

Authorized officer

O'Reilly, D

## INTERNATIONAL SEARCH REPORT

International Application No

PCT/GB 98/00866

## C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

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International application No.  
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because they relate to parts of the International Application that do not comply with the prescribed requirements to such an extent that no meaningful International Search can be carried out, specifically:
3. ☐ Claims Nos.:  
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

## Box II Observations where unity of invention is lacking (Continuation of item 2 of first sheet)

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see additional sheet

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**2. Claims: 24,25**

Vibration analysis using a sensor

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Information on patent family members

International Application No

PCT/GB 98/00866

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US 5509013 A	16-04-1996	JP 7074722 A	17-03-1995
DE 4131341 A	26-11-1992	NONE	
DE 4106572 A	03-09-1992	NONE	
EP 685390 A	06-12-1995	CA 2096069 A CA 2185473 A DE 69315887 D DE 69315887 T EP 0569994 A JP 6135395 A US 5571969 A	15-11-1993 15-11-1993 05-02-1998 20-05-1998 18-11-1993 17-05-1994 05-11-1996
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